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Speech characteristics of children post Reye's Syndrome

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THE SPEECH CHARACTERISTICS OF CHILDREN POST REYE'S SYNDROME

By

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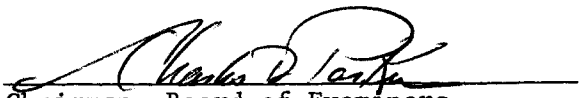

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INTRODUCTION

The speech pathologist working in a hospital, clinic or public school setting may come in contact with clients who have suffered from a variety of syndromes or disorders. One syndrome, diagnosed barely 15 years ago, that a speech pathologist may encounter, is Reye's Syndrome. It was first described by Reye et al in 1963 as being characterized by acute encephalopathy associated with fatty infiltration and dysfunction of the liver. Outstanding clinical features include profoundly impaired consciousness, convulsions, altered muscle tone and reflexes, hypoglycemia and low glucose levels in the cerebrospinal fluid (Reye et al, 1963; Dobrin, 1980; Weil, 1981).

The cause of Reye's Syndrome is unknown. It affects males and females ranging in age from one to two months to adults in their fifties. However, the majority of patients affected by the syndrome are younger than 16 years of age. The course of Reye's Syndrome typically begins with the onset of an upper respiratory infection, gastroenteritis or a viral infection. The symptoms may be mild or even as non-specific as a cough or sore throat. Within three to six days, the illness generally develops into protracted vomitting and altered states of consciousness. The patient may be lethargic, disoriented or combative (Dobrin, 1980; Weil, 1981).

Reye's Syndrome is a major cause of infant mortality due to virus related diseases of the central nervous system and one of the most severe neurological disorders of childhood (Dobrin, 1980). Most outbreaks of Reye's Syndrome are temporally and geographically clustered; the median age for Reye's Syndrome occurrence is 11 years. Although

most cases occur during the winter months when an increase in respiratory disease is seen among children, a small number of cases occur sporadically throughtout the year. It has been associated most often with influenza A and B but has been related to other viral agents such as Varicella. In the past, the occurrence of Reye's Syndrome has been found to be clustered geographically in areas where epidemilogical outbreaks of viral infections have occurred. For example, from December 1978 to November 1979 the incidence of Reye's Syndrome affecting more than one out of 100,000 children less than 18 years of age occurred in Montana, Utah, Colorado, Arizona, New Mexico, Oklahoma, South Dakota, Nebraska, Michigan, Ohio and Georgia (Nelson et al, 1979).

Lovejoy (1974) devised a staging criteria for descriptive analysis of children progressing through Reye's Syndrome. The criteria consist of five stages describing the various behavioral, neurological and biochemical sequelae occurring as Reye's Syndrome becomes increasingly worse (Dobrin, 1980; Lovejoy, 1974; Boutros, 1980). These five stages are described below.

Stage I: The patient is vomitting, lethargic and/or sleepy. There is laboratory evidence of hepatic dysfunction. There is a type 1 electroencephalograph (EEG).

Stage II: The patient is combative, disoriented, delirious, hyperventilating and hyperreflexive. Appropriate response to painful stimuli exists. Evidence of hepatic dysfunction continues. There is a type 2 EEG.

Stage III: The patient is obtunded or comatose and hyperventilating; may not respond to pinprick stimulus; exhibits increased muscular tone or decorticate posturing. Pupillary, oculovestibular and oculocephalic reflexes are preserved. There is continued evidence of hepatic dysfunction. Type 2 EEG continues.

Stage IV: The patient experiences deepening coma. There are signs of brainstem dysfunction at this stage including: decerebrate rigidity or posturing, chronic increase in tone, loss or dysfunction of oculocephalic reflexes, large, fixed pupils and dysconjugate eye movements in response to caloric stimulation. Liver dysfunction becomes minimal. There is a type 3 or 4 EEG.

Stage V: The patient is flaccid with loss of deep tendon reflexes. He may experience seizures, respiratory arrest and cardiovascular instability. Liver function tests may show improvement. Type 4 EEG is present.

Stage III and IV are usually correlated with the onset of cerebral edema and an increase in intracranial pressure which can lead to permanent brain damage. Survivors of Rey's Syndrome who have suffered brain damage may exhibit varying degrees of severity of one or a combination of neurological, behavioral, psychological and intellectual sequelae. These sequelae may take the form of learning disabilities, speech and language disorders, visual deficits, behavioral disorders, reduced intelligence, quadriplegia and/or hemiparesis (Datta and Reed, 1979; Trauner, 1979; Kolata, 1980).

No studies have examined the speech characteristics of patients who have suffered from Reye's Syndrome. However, Davidson et al (1978) and Brunner et al (1979) did examine the neurological and intellectual-psychological sequelae of Reye's Syndrome. Davidson found, in addition to various other neurological, psychological and intellectual sequelae, that some of his subjects experience mild dysarthria of speech, disarticulations and absence of expressive verbal speech. In general, the results of both studies indicated that:

1. The initial neurological abnormalities present upon hospitalization were minimally related to eventual neuropsychological outcome post-recovery.

2. The amount of time of disordered brain function in the most acute stage of Reye's Syndrome was a good predictor of eventual neuropsychological outcome.
3. The incidence of psychological sequelae was closely related to the age of onset of Reye's Syndrome; age of onset was found to be a reliable index of prognosis. The older the patient at onset, the poorer the prognosis.
4. Older children benefitted greatly from language and physical therapy.

The cerebral edema and secondary increase in intracranial pressure that may be associated with Reye's Syndrome can cause brainstem herniation and/or varying degrees of brainstem and central nervous system damage (Dobrin, 1980; Davidson et al, 1978; Kolata, 1980). The effect of this type of damage on speech is variable. Speech deficits associated with central nervous system and/or brainstem damage may range from being nonexistent to severe. If there is paralysis or weakness of the speech musculature, the parameters of articulation, voice, resonance and respiration may be affected (Darley, 1975; Johns, 1978). Based on the fact that Reye's Syndrome patients have been described as having speech disorders, this study was designed to examine the speech production characteristics of children post Reye's Syndrome.

The primary objective of this study was to search for possible disorders in the four areas of articulation, voice, resonance and respiration. The secondary objectives of this study were to determine:

1. if any relationship existed between the duration of the most severe stage and the resultant speech characteristics.
2. if speech therapy post Reye's Syndrome leads to substantial improvement in children with speech dificits resulting from Reye's Syndrome.
3. if age of onset, neurological sequelae at the time of the most severe stage or speech production ability directly post Reye's Syndrome could be utilized as a prognostic factor for the

eventual outcome in speech production ability.

SUBJECTS

The subjects in this study consisted of three male and two female children. The subjects ranged in age from seven to 17 years and were three to nine years post onset of Reye's Syndrome. Based on Lovejoy's grading system, each child was classified as having reached at least a stage III during his most severe stage of the syndrome. One child reached stage IV, while another reached stage IV and one-half and showed some characteristics of stage V. EEG grades across subjects during the most severe stages ranged from two to five. The amount of time of brain dysfunction during the most severe stage ranged from 24 hours to 42 days. All children had been developing normally and had uneventful case histories prior to the onset of Reye's Syndrome.

METHODS

Examples of the test protocal, volunteer agreement and privacy act statement are presented in the appendix. The evaluation of speech characteristics was divided into two sections. Section 1 contained six parts and section 2 contained three parts. Section 1 required subject-examiner interaction, while section 2 did not. Most of the information gathered during section 1 was tape recorded for reassessment during section 2. Section 2 involved one and sometimes two judge assessment of the tape recorded information obtained in section 1. This was to assure inter/intra judge reliability. The six parts included in section 1 consisted of:

1. One investigator obtaining case history information from the subject's parents and/or medical records. The information sought for pertaining to Reye's Syndrome was:
    a. age of onset when Reye's Syndrome was contracted
    b. most severe stage reached and duration at that stage
    c. related disorders secondary to the syndrome, and
    d. behavioral status and speech, hearing, language, auditory perceptual and intellectual capabilities and/or disorders pre, and directly post Reye's Syndrome and at the present time.
2. Two investigators subjectively evaluating the voice and breathing characteristics as each subject engaged in a 15 minute monologue. As the subjects talked, two investigators observed, listened and marked appropriately on a checklist, the type and general description of the subjects breathing and location of any tension sites. The subject's number of breaths per minute was then calculated. The two investigators then listened to the subject's voice and marked on a checklist their subjective impressions of the subject's voice, which includes rate of speech, prosody, inflectional patterns, loudness, pitch, quality, resonance and related observations.
3. One investigator administering and tape recording the Goldman-Fristoe Test of Articulation. The subject verbally identified pictures depicted on cards. The investigator recorded any articulation errors the subject exhibited.
4. One investigator having each subject imitate his verbal production in the following speech situations: nine consonant-vowel, nine vowel-consonant combinations; 12 words and three sentences. This was tape recorded for later assessment of vocal resonance characteristics.
5. One investigator counting the number of breaths per minute as the subject sat at rest without talking.
   Pitch range and breath control were not assessed as three of the subjects either would not cooperate or did not understand the task.
6. The last part of the evaluation that required subject/examiner interaction was the speech mechanism exam. One investigator assessed the structure, function and integrity of the subject's oral mechanism.

The three parts of section 2 consisted of:

1. One investigator assessing the intelligibility of the subject's words in conversation and in isolation from five minutes of the subject's taped monologue and from the Goldman-Fristoe Test of Articulation.
2. Two investigators reassessing the subject's voice characteristics from the taped monologue. The purpose of this was to assure reliability of observations within investigators and across time.

3. Two investigators assessing the vocal resonance characteristics of the tape recorded productions obtained in section 1 of the evaluation. For each of the speech situations listed, each judge listened for and indicated any presence of nasal emission, assimilative nasality, nasal snorts and denasality.

RESULTS

The results of the study are presented in table 1. The data presented include subject, age at onset of Reye's Syndrome, years post Reye's Syndrome, most severe stage reached and duration at that stage, EEG grade consistent with the most severe stage reached, sequelae directly post Reye's Syndrome, present sequelae and present speech characteristics.

Based on the results of the study, the five subjects were divided into two groups. Group one consisted of two subjects who each reached stage III to IV for a period of 24 to 48 hours. Both subjects were within normal limits for speech production abilities directly post Reye's Syndrome and remain so at this time. Only one of the subjects suffered from any neurological, behavioral or psychological sequelae. These sequelae, still present to a lesser degree eight years post Reye's Syndrome, are characterized by hyperactivity, restlessness, decreased attention span, irritability, mood swings, severe headaches and seizures.

Group two consisted of three subjects. The most severe stage reached for this group ranged from stage IV to stage IV and one-half. The duration at the most severe stage ranged from two to 42 days. The non-speech sequelae, existing directly post Reye's Syndrome and presently to a milder degree, commonly shared by this group consisted of

Ss	AGE AT ONSET	YEARS POST	MOST SEVERE STAGE AND DURATION	EEG GRADE	SEQUELAE DIRECTLY POST R.S.*	PRESENT SEQUELAE	PRESENT SPEECH CHARACTERISTICS
MW	8 yrs	4	stage 4½ 4 days stage 5 42 days	4 one 5	spastic quadrplegia ↓visual acuity ** ↓rate of speech ↓loudness monotone speech ↓inflectional patterns ↓attention span growth spurt	spastic diaplegia ↑visual acuity ↑attention span ↓intellectual capacity improved speech and ↑language skills	Artic: distorted affricates and fricatives Rate: decreased Prosody: choppy Inflectional Patterns: monotone Loudness: Within Normal Limits (WNL) Pitch: low Quality: harsh, hoarse Resonance: inconsistent nasality (NA) and nasal emission (NE) Other: occasional hard glottal attack Breathing: thoracic; shallow, arrhythmic Speech Mechanism: ↓ strength in tongue tip Hearing: moderate unilateral sensorineural loss
BB	3 yrs	9	stage 4 14 days	3	↓visual acuity ↓swallowing/sucking abilities drooling	↑visual acuity ↓intellectual capacity ↑attention span drooling	Artic.: severe consonant and vowel substitutions, omissions and distortions Rate: fast Prosody: choppy Inflectional Patterns: WNL Loudness: WNL Pitch: WNL Quality: WNL Resonance: inconsistant NA and assimilative NA Other: hard glottal attack Breathing: abdominal; shallow, arrhythmic Speech Mechanism: bilateral weakness of the tongue and lips with ↑ weakon the right side Hearing: WNL

*Reye's Syndrome ** ↓decreased ↑increased

Table 1. Characteristics of Children Post Reye's Syndrome

Ss	AGE AT ONSET	YEARS POST	MOST SEVERE STAGE AND DURATION	EEG GRADE	SEQUELAE DIRECTLY POST R.S.*	PRESENT SEQUELAE	PRESENT SPEECH CHARACTERISTICS
MS	3 yrs	8	stage 3-4 2 days	3	↓ attention span hyperactivity restlessness irritability severe headaches mood swings seizures	same as directly post; slight improvement shown	all present speech characteristics were assessed as being WNL
AK	4 mos	7	stage 4-5 2 days	3	spastic hemiplegia seizures ↓ speech/language ↓ visual acuity	↓ intellectual capacity ↑ visual acuity ↑ vocabulary and sentence length left hemiparesis severe headaches absence of seizures	Artic.: multiple consonant and vowel substitutions, distortions and omissions speech slurred Rate: WNL Prosody: inconsistently choppy Inflectional Patterns: WNL Loudness: WNL Pitch: WNL Quality: WNL Resonance: WNL Breathing: WNL Speech Mechanism: slight weakness of the left side of the face Hearing: WNL
PE	14 yrs	3	stage 3-4 1 day	2-3	none	none	all present speech characteristics were assessed as being WNL

*Reye's Syndrome ** ↓ decreased ↑ increased

Table 1. Characteristics of Children Post Reye's Syndrome

decreased visual acuity and reduced intelligence. The present speech production characteristics common to group two were found to be multiple articulation errors at both the word and conversation level and mild to moderately severe dysarthria.

Many individual differences existed in the type of non-speech sequelae existing directly post Reye's Syndrome and at the time of the study for Group 2. The first subject, an 8 year-old at onset, who reached stage IV and one-half for four days, followed by 42 days of stage III, was the most involved child in the study. This subject's non-speech sequelae directly post Reye's Syndrome consisted of spastic quadriplegia, which still exists to a milder degree, and premature onset of puberty. In addition to the problems of dysarthria and resultant misarticulations, the following speech production characteristics were noted: slow rate, choppy prosody, monotone speech, normal to low pitch, harsh-hoarse quality, inconsistent hypernasality and nasal emission, inconsistent hard glottal attack and shallow and arrhythmic breathing.

The second subject in Group 2 was 3 years old at onset and reached stage IV for a period of 14 days. His difficulties directly post Reye's Syndrome included an inability to suck or swallow. His present non-speech sequelae are characterized by reduced swallowing ability, causing him to drool occasionally, and decreased attention span. This subject's speech production abilities are characterized by severely reduced intelligibility of speech as a result of multiple consonant and vowel substitutions, distortions and omissions, increased rate of speech,

choppy prosody, inconsistent hypernasality and assimilative nasality, shallow and arrhythmic breathing, increased contraction of the diaphram on initiation of phonation and within normal limits quality, loudness, pitch, and inflectional patterns.

The third subject in Group 2 contracted Reye's Syndrome at four months of age. He reached stage IV to V for a period of two days, including two episodes of respiratory arrest. The non-speech sequelae directly post Reye's Syndrome included spastic hemiplegia and an occurrance of seizures until age three years six months. Seven years later this child suffers from left hemiparesis and severe headaches. Speech was severely delayed in developing. Present speech characteristics in addition to misarticulations and dysarthria, include occusional choppy prosody and within normal limits rate, inflectional patterns, loudness, pitch, quality and breathing.

DISCUSSION

The primary objective of this study was to search for possible disorders in the four areas of articulation, voice, resonance and respiration of patients who have suffered from Reye's Syndrome. The subjects who reached the more severe stages of Reye's Syndrome and remained there for four to 42 days showed an increase in the number and severity of speech production disorders. These subjects exhibited moderate to severe disorders in all, or a majority of the areas of articulation, voice, resonance and respiration. Those subjects who did not reach the more severe stages of Reye's Syndrome and did not remain at a severe stage for a long duration, did not show an increase in the number and

severity of speech production disorders.

The secondary objectives of the study were to determine:

1. if any relationship existed between the duration of the most severe stage and the resultant speech characteristics.
2. if speech therapy post Reye's Syndrome leads to substantial improvement in children with speech deficits resulting from Reye's Syndrome.
3. if age of onset, neurological sequelae at the time of the most severe stage or speech production ability directly post Reye's Syndrome could be utilized as a prognostic factor for the eventual outcome in speech production ability.

A relationship was found to exist between the duration of time at the most severe stage reached and the resultant speech production characteristics post recovery of Reye's Syndrome. Duration of more than two days at the most severe stage resulted in moderate to severe disorders in all or most of the areas examined.

The subjects with speech production disorders as a result of the brain damage associated with Reye's Syndrome who had received speech therapy all demonstrated significant improvement in speech production abilities previous to the time of the study. It is not known, however, if the improvement in speech production abilities was primarily due to natural recovery or speech therapy. The three subjects with speech production disorders, who ranged from four to nine years post Reye's Syndrome, had received speech therapy on a regular basis from the speech/language clinician in the local school system. Reports from classroom teachers, speech-language clincians, parents and medical and school records indicated that substantial improvement in speech production abilities had occurred post Reye's Syndrome.

Due to the limited population sampled, it was not possible to

determine if age of onset was a reliable prognostic indicator for eventual outcome of speech production abilities. The neurological sequelae present during the most severe stages of Reye's Syndrome may be related to the eventual outcome of speech production abilities. In part, Lovejoy's (1974) stages are characterized by existing neurological sequelae, i.e. decorticate posturing-stage III; decerebrate rigidity-stage IV. If the subjects who reach the more severe stages of Reye's Syndrome suffer from more severe speech production deficits post Reye's Syndrome, then it appears that the neurological sequelae present during the most severe stage may be related to the eventual speech production outcome post Reye's Syndrome. It was not possible to determine if speech production characteristics directly post Reye's Syndrome were related to eventual outcome in this area. This was due to the limited amount of information available concerning each subject's speech production abilities at that time.

Clinically, the results of this study may aid the speech clinician in counseling parents of children recovering from Reye's Syndrome. Knowing that a child had reached a severe stage of Reye's Syndrome and remained there for a long period of time, the speech clinician would be able to make some general prognostic statements about the eventual speech production abilities of that child. In addition, the speech clinician would be able to tell the parents that their child would most likely make substantial improvements in speech production abilities through a speech therapy program.

The results of this study indicate a further need for research in

the areas of speech pathology and Reye's Syndrome. A follow-up study on a larger number of patients is needed to determine if age of onset could be utilized as a prognostic factor for speech production outcome post recovery. Brunner et al (1979) proposed that much of the brain damage that is associated with Reye's Syndrome is transient. Although unrealistic in nature, perhaps a study comparing the recovery of speech production abilities of children who have had speech therapy post Reye's Syndrome versus those who haven't would support Brunner's proposal.

What is also needed at this time is a study that would be initiated directly post hospitalization of Reye's Syndrome children and would carefully examine the changes in speech production abilities over a period of five to 10 years. It may then be possible to determine if speech production abilities directly post Reye's Syndrome could be utilized as a prognostic factor for eventual speech production outcome post recovery.

SUMMARY

Reye's Sundrome is a disorder characterized by acute encephalopathy and liver dysfunction. The cerebral edema and increase in intracranial pressure associated with Reye's Syndrome may lead to brain damage, resulting in a variety of neurological, behavioral, psychological and intellectual sequelae. Among other things, these sequelae may exist as speech and/or language disorders. This study was designed to examine the speech production characteristics of children post Reye's Syndrome. The subjects consisted of three males and two females. Age

at onset ranged from four months to 14 years and years post Reye's Syndrome at the time of this study varied from three to nine. The most severe stage of Reye's Sundrome reached ranged from stage III to stage IV and one-half. The duration at the most severe stage reached ranged from 24 hours to 42 days.

The areas of articulation, voice, resonance and respiration were evaluated. One examiner was utilized unless inter/intra judge reliability was important, at which time two examiners were utilized. The results of the study indicated that longer duration at the most severe stage reached was related to eventual speech production outcome. The subjects who remained at the more severe stages of Reye's Syndrome for two to 42 days sustained moderate to severe speech production deficits in all or most of the speech production areas examined. It was determined that all of the subjects with speech production disorders as a result of the brain damage associated with Reye's Syndrome improved substantially in speech production abilities. It was determined that the neurological sequelae present during the most severe stages of Reye's Syndrome may be a prognostic factor for eventual speech production outcome post recovery. Lovejoy (1974) utilized neurological sequelae as criteria for his staging system. The more severe neurological sequelae indicate the more severe stages of Reye's Syndrome which in turn tend to result in an increase in the number and severity of speech production disorders. It was not possible to determine if age of onset or speech production characteristics directly post Reye's Syndrome could be utilized as a prognostic indicator for eventual

speech production abilities.

This study, investigating the speech characteristics of children post Reye's Syndrome, proved to be extremely interesting. It not only provided new insights into the relationship between Reye's Syndrome and speech pathology, but created new areas for further research.

APPENDIX A

****DURING THE EVALUATION****

-One Judge Assessment-

I. IDENTIFYING INFORMATION

Directions: a. Interview parents for information.
b. Check medical record for stage reached, duration at that stage, neurological findings, sequelae.

NAME	DATE	
PARENT'S NAME	DOB	
ADDRESS	AGE	SEX
PHONE #: HOME WORK	EXAMINERS	
SCHOOL/ADDRESS	NAME OF SPEECH CLINICIAN IF RECEIVING SERVICES PHONE #	

AGE AT ONSET	MOST SEVERE STAGE REACHED/DURATION AT THAT STAGE

NEUROLOGICAL FINDINGS IN CORRELATION WITH LAST STAGE REACHED (INCLUDE EEG GRADE) post Reyes — SEQUELAE

NOW

RELATED DISORDERS 2° to SYNDROME (HEARING, SIGHT, ATTENTION)

SPEECH, HEARING, LANGUAGE, AUDITORY PERCEPTUAL DISORDERS PRE & POST REYE'S SYNDROME

	OBJECTIVE MEASURES	SUBJECTIVE MEASURES
PRE:		

SPEECH, HEARING, AUDITORY PERCEPTUAL DISORDERS PRE & POST (con'd)

	OBJECTIVE MEASURES	SUBJECTIVE MEASURES
Directly POST:		
Now		

INTELLECTUAL CAPABILITY PRE & POST REYE'S SYNDROME

	OBJECTIVE MEASURE	SUBJECTIVE MEASURE
PRE:		
POST:		

BEHAVIORAL STATUS PRE & POST REYE'S SYNDROME

Check:	PRE	POST
Hyperactive		
Restless		
Distractable		
Short attention span		
Inappropriate affect		
Aggressive		
Response scatter		
Manipulative		
Passive		
Quiet		
Uncooperative		
Unfriendly		
Uncoordinated		
Emotionally labile		
Persverative		
Apprehensive		
Willful		

COMMENTS/OTHER RELEVANT DATA

****DURING THE EVALUATION****

-Two Judge Assessment-

II. LANGUAGE SAMPLE - 15 minutes [TAPE THIS]

Directions: 1.a. assess type of breathing by observation or by placing one hand on chest and one on abdomen.

1.d. count # inhalations for one minute period- do twice.

2. assess voice by listening/making judgements/check appropriate lines.

1. BREATHING:

a. Type

_____clavicular _____thoracic ____abdominal ___ other:_____

b. General description during conversation:

_____ shallow ____ arrhythmic ____ normal

c. Tension sites:

_____ neck ____choulders ____face ____ general body ____other:_____

d. # breaths/minute during conversation: (2x)_____, _____

2. VOICE:

a. Rate:

_____ fast ____slow ____consistent ____normal

b. Prosody:

_____ choppy ____normal

c. Inflectional patterns:

_____ monotone ____ abnormal ____ normal

d. Loudness:

_____too loud ____too soft ____abnormal variation in intensity ____normal

e. Pitch:

_____too high ____too low ____normal

f. Quality:

_____breathy ____harsh ____hoarse

g. Related observations:

_____aphonic ____pitch breaks ____glttl fry ____phonat. breaks

_____hard glttl attack ____spastic dysphonia

h. Resonance:

_____hypernasal ____denasal ____assimilative nasality ____nasal emission ___nasal snort

COMMENTS/OBSERVATIONS:

****DURING THE EVALUATION****

-One Judge Assessment-

III. ARTICULATION- GOLDMAN FRISTOE TEST OF ARTICULATION [TAPE THIS]
Directions: administer the test; fill in errors on summary sheet below.

Tape #:

	OMISSIONS	SUBSTITUTIONS	DISTORTIONS
Initial Position			
Medial Position			
Final Position			

IV. PITCH [TAPE THIS]
Directions: have subject start where comfortable and sing as high as possible without straining. Repeat. Now have subject sing as low as possible without straining. Repeat. Demonstrate- make sure break exists between tones- ex. ah-ah-ah.

Tape #:

V. IMITATIVE SPEECH PRODUCTION [TAPE THIS]
Directions: have subject imitate your production of the following CVs, words, and sentences.

a. CV Production:

bi	vi	zi	pi	fi	si
ib	iv	iz	ip	if	is
gi	di	ʃi	ki	ti	ri
ig	id	iʃ	ik	it	ir

b. Words:

pat	tan	dip
shop	not	back
car	make	rat
sat	vat	got

c. Sentences:
Mary likes milk in the morning.
Mommy, give me a Hong Kong cookie.
Does your sister still sew.

******DURING THE EVALUATION******

VI. BREATHING

Directions: Using a stopwatch: a. count # breaths per minute at rest. do twice. b. control- have subject inhale a "good breath" and count as high as possible on one exhalation. do twice. Have subject sustain sss, zzz, ah, and eee each on one exhalation for as long as possible. Note # of seconds each takes, do each twice.

a. # breaths per minute at rest (2x): _____;_____

b. Control:
1. counts on one breath: _____ ;_____
2. sustain s-s-s-s: _____;_____
3. sustain z-z-z-z: _____ ;_____
4. sustain ahhh: _____;_____
5. sustain eeee: _____;_____

Comments:

VII. SPEECH MECHANISM EXAM

Directions:

STRUCTURE	FUNCTION
Lips: symmetrical____ other:_____	Lips- ability to: pucker____ smack ____ smile ____ open/close_____ resist clinician's effort to push in_____ other:_____
Tongue: size- normal_____ large _____ small _____ frenum- normal_____ restrictive_____ other:	Tongue- ability to: move in/out_____ " quickly_____ move side/side_____ " quickly _____ touch "nose & chin" _____ " quickly _____ protrude tongue- resist clinician's effort to push in _____ touch behind upper teeth _____ touch behind lower teeth _____ place tongue against cheek & resist clinician's effort to push in _____ other:_____
Velopharyngeal Port: hard palate- height normal_____ low _____ high _____ soft palate- length normal_____ long_____ short_____ uvula- normal_____ bifid_____	Comments:

******DURING THE EVALUATION******

STRUCTURE	FUNCTION
Jaw: maxilla- normal_____ abnormal_____ mandible- normal_____ abnormal_____ Teeth: occlusion- normal_____ mesiocclusion_____ distocclusion_____ missing teeth_____ condition of teeth good_____ bad_____ other:_____	Velopharyngeal Port- ability to: occlude port on phonation of /a/_____ blow through mouth alone_____ puff cheeks-resist efforts to push it in_____ puff cheeks with tongue anchor_____ other:_____ Jaws- ability to: open/close_____ other:_____
Comments:	Comments:

APPENDIX B

******POST EVALUATION******

USING TAPED INFORMATION

One judge assessment

I. INTELLIGIBILITY

Directions: a. from 5 minutes of Language Sample count # words understood and # words not understood. Add. This is total. Divide # understood by total.

b. same instructions as "a." but take words from articulation test.

a. measured intelligibility of words in conversation:_____

b. measured intelligibility of words in isolation:_____

II. PITCH

Directions: a. using pitchpipe, determine pitch range.

b. using pitchpipe, determine habitual pitch from language sample.

c. compute optimum pitch using the two methods stated.

d. indicate normal range for sex and age; cite reference

a. Pitch Range:_____ to_____

b. Habitual Pitch:_____

c. Optimum Pitch:

1. 1/3 method:_____

2. 1/4 method:_____

3. other:_____(indicate procedure)

d. Normal pitch Range for Age and Sex:_____to_____

III. RATE

Directions: from 5 minutes of language sample transcribe conversation, note total number of words. Divide total words by 5, result is WPM.

a. Rate of Speech:_____WPM.

Two Judge Assessment

I. FROM LANGUAGE SAMPLE- Assess:

1. VOICE:

a. Rate

___fast___slow___consistent___normal

b. Prosody

___choppy___normal

c. Inflectional Patterns

___monotone___abnormal___normal

d. Loudness

___too loud___too soft___abnormal variation in intensity___normal

e. Pitch

___too low___too high___normal

f. Quality

___breathy___harsh___hoarse

g. Related Observations

___aphonic___pitch breaks___glottal fry___phonation breaks

___hard glottal attack___spastic dysphonia

h. Resonance

___hypernasal___denasal___assimilative nasality___nasal emission

****POST EVALUATION****

II. RESONANCE

Directions: following each of the imitative speech situations

note: NE- nasal emission (especially on plosives, affricates, fricatives)
ASNA- assimilative nasality (on vowels adjacent to nasals)
NA- nasality
NS- nasal snort
DENA- denasal

a. CV Production

bi_____	zi_____	fi_____
ib_____	iz_____	if_____
gi_____	ʃi_____	ti_____
ig_____	iʃ_____	it_____
vi_____	pi_____	si_____
iv_____	ip_____	is_____
di_____	ki_____	ri_____
id_____	ik_____	ir_____

b. Words

pat_____	make_____
shop_____	vat_____
car_____	dip_____
sat_____	back_____
tan_____	rat_____
not_____	got_____

c. Sentences

Mary likes milk in the morning.

_____

Mommy give me a Hong Kong cookie.

_____

Does your sister still sew.

_____

RESONANCE SUMMARY- CHECK PRESENCE OF:

	CV	WORDS	SENTENCES	CONVERSATION
Hypernasality				
Denasality				
Assimilative Nasality				
Nasal Emission				
Nasal Snort				

****SUMMARY STATEMENTS****

ARTICULATION

Conversation

Words

Intelligibility (conversation & words)

VOICE

(Include rate, prosody, inflectional patterns, loudness, pitch, quality and related observations)

RESONANCE

(Include presence of NE, NA, ASNA, NS and DENA on production of CV, words, sentences, and conversation)

SUMMARY STATEMENTS (con'd)

BREATHING

(Include # breaths per minute at rest and during conversation; breath control; type; general description; tension sites)

SPEECH MECHANISM EXAM

(Include information of structure and function of the speech mechanism,

APPENDIX C

VOLUNTEER AGREEMENT

I/We, _____
having full capacity to consent, do hereby consent for my/our

_____,
(Relationship) (Name of Participant)
to participate in a clinical investigational study entitled:
"The Speech Characteristics of Children Post Reye's Syndrome"
under the direction of _____.
The implications of his/her participation; the nature, duration and purpose; the methods and means by which it is to be conducted; and the inconveniences and hazards which may reasonably be expected to have been explained to me/us by _____, and are set forth on the reverse side of this Agreement, which I/We have initialed. I/We have been given an opportunity to ask questions concerning this investigational study, and any such questions have been answered to my/our full and complete satisfaction.

I/we understand and I/we may at any time during the course of the investigational study revoke my/our consent, and withdraw the above named participant from the study without prejudice; however, he/she may be requested to undergo certain further examinations, if in the opinion of the attending physician such examinations are necessary for his/her health or well being.

I understand that in the event of physical injury resulting from the investigational procedures, essential medical treatment (including hospitalization) is available. I also understand that financial compensation may be available and information regarding such compensation can be obtained from the Staff Judge Advocate at FAMC.

_____	_____	_____
Signature	Relationship	Date

_____	_____	_____
Signature	Relationship	Date

I was present during the explanation referred to above, as well as the Parent's/Guardian's/Next of Kin's opportunity for questions, and hereby witness their signature.

_____	_____
Witness' Signature	Date

EXPLANATION OF STUDY

This study, which has not been performed prior, is being conducted to identify, define and compare the speech characteristics of children who have suffered from Reye's Syndrome. Your participation in the study will be to provide information about your child to the investigator. This includes information about the duration of time your child suffered from Reye's Syndrome and the extent of physiological damage resulting from the Syndrome. You will also be asked to provide information about any present disorders your child has as a result of Reye's Syndrome. Information about speech, hearing, language, auditory perceptual and intellectual capabilities/disorders pre and post Reye's Syndrome will also be asked for as will information concerning your child's behavioral status pre and post Reye's. Your interview should take approximately 30 minutes.

Your child's participation involves:

1. His/her talking for 15 minutes about any subject that interests him/her.
2. His/her looking at pictures on a card and verbally identifying the picture depicted on the card.
3. His/her singing "ah" as high as he/she can and as low as he/she can.
4. His/her repeating some syllables, words, and sentences after the examiner.
5. His/her sustaining the sounds sss, zzz, ahh, eee, and counting as high as possible, each on one deep breath.
6. His/her moving his/her lips or tongue as the examiner instructs, puffing his/her cheeks out with air, letting the examiner look into his/her mouth with a flashlight. Here the examiner will be assessing the structure and function of your child's speech mechanism.

Your child's participation should take approximately 1-4 hours.

There are no physical or mental risks, discomforts or inconveniences involved in participation in this study.

The benefit of the study for your child is that he/she will be receiving a free speech evaluation. Specific recommendations based on the evaluation results will be provided.

If you have any questions or concerns before, during or after the evaluation, do not hesitate to contact Sarah Scharfenaker at 341-8884.

_____
(Parent/Guardian Initials)

APPENDIX D

PRIVACY ACT STATEMENT

VOLUNTEER AGREEMENT/CONSENT FORM

AUTHORITY

Section 301 of Title, U.S. Code; Section 3101 of Title 44, U.S. Code; Section 1071-1087 of Title 10, U.S. Code; and Executive Order 9397.

PRINCIPLE PURPOSES

The purpose for requesting personal information is to provide the various types of data needed to satisfy the scientific objectives of the study and to provide the minimum information necessary should you require medical treatment at any future time for a condition proximately resulting from your participation in this investigational study, or so that steps can be taken to contact you should it later be deemed in your best interests to do so.

ROUTINE USES

This information may be used to implement health and communicable disease control programs; provide full documentation of investigative studies; conduct further research; teach; compile statistical data; adjudicate claims and determine benefits; and report medical conditions required by law to other Federal, state and local agencies. It may be used for other lawful purposes, including law enforcement and litigation. Even though permitted by law, whenever possible, this personal data will not be released without your consent.

MANDATORY OR VOLUNTARY DISCLOSURE AND EFFECT ON INDIVIDUAL NOT PROVIDING INFORMATION

The disclosure of requested information is voluntary. If the information is not furnished, and/or not available from other scources, your voluntary participation in this investigational study may be precluded.

I understand that a copy of the Volunteer Agreement, together with a copy of this form, may be placed in my health records as evidence of this notification, and that additional copies may be retained permanently by the investigator and by the U.S. Government. I have received or have declined to accept a copy of the Volunteer Agreement and a copy of this form which I may keep.

_____

Signature Date

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